

DANIELLEILONA GEN.NOV., FROM THE WET TROPICS, NORTHEASTERN QUEENSLAND (PULMONATA:CHAROPIDAE)

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A new genus of charopid, *Danielleilona* gen.nov., is described from the summits of the high mountains in the Wet Tropics, NEQ. Two species, *D. marycolliverae* sp.nov. and *D. multicostata* sp. nov., occur in geographically proximate, yet isolated, mountain ranges south of Cairns. The distribution pattern is novel in relation to previously described charopids from the region and its biogeographic significance is discussed. The unusual conchological and anatomical features of the genus are related to other Australian charopids. □ *Pulmonata, Charopidae, Danielleilona, new genus, D. marycolliverae, D. multicostata, new species, systematics, biogeography, Wet Tropics.*

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Stanisic (1987) reviewed the status of the charopid genus *Oreokera* and briefly referred to the diversity of the Charopidae in the Wet Tropics. Traditionally this family has been regarded as having a temperate distribution with only a few species living in tropical Queensland (Iredale, 1937; Smith, 1984). Field work by staff of the Queensland Museum has revealed a significant number of species in both subtropical and tropical eastern Queensland (Stanisic, 1990).

Danielleilona gen.nov. includes two new, large species of Charopidae from the tops of high mountains south of Cairns, NEQ. These mountains are renowned for the restricted floral and faunal elements near their peaks (Monteith 1980). The two land snails are similarly restricted and add to knowledge of this area. This study examines the conchological and anatomical characters of *Danielleilona* and places them in a biogeographic context.

The following abbreviations are used: Q—Queensland; QM—Queensland Museum, Brisbane; AM—Australian Museum, Sydney; A—anus; DG—prostate; E—epiphallus; EC—epiphallic caecum; G—ovotestis; GD—hermaphroditic duct; GG—albumen gland; GT—talon; H—heart; HG—hindgut; HV—hindvein; I—intestine; K—kidney; KD—ureter; KX—ureteric pore; MC—mantle collar; P—penis; PC—penial caecum; PCP—penial caecum pore; PP—penial pilaster; PPM—main penial pilaster; PRM—penial retractor muscle; PS—penial sheath; S—spermatheca, SS—spermathecal stalk; UT—uterus; UV—free oviduct; V—vagina; VD—vas deferens; X—carrefour; Y—atrium; Z—digestive gland.

SYSTEMATICS

Family Charopidae

Danielleilona gen.nov.

ETYMOLOGY

For my eldest daughter Danielle Ilona

TYPE SPECIES

Danielleilona marycolliverae sp.nov.

DIAGNOSIS

Shell large, with about 4½ tightly coiled whorls, the last expanding more rapidly. Apex and spire flat to very slightly elevated. Apical whorls with low, rounded, rugosely sculptured spiral cords. Postnuclear sculpture of prominent, very strongly protractively sinuated, moderately crowded (*multicostata*) to widely spaced (*marycolliverae*), broad radial ribs; apices with radial riblets. Microsculpture of fine, crowded radials and spirals crossing in a regular lattice. Umbilicus deep, narrow U to V-shaped, margins rounded. Sutures strongly channelled. Lip simple with a prominent apertural sinus; aperture roundly lunate.

Genitalia with ovotestis consisting of two clumps of finger-like lobes oriented parallel to the plane of coiling. Talon with long, coiled shaft. Epiphallus partially enveloped in the penial sheath, with a short caecum and entering penis apically. Penis long with a lateral outpocket (*marycolliverae*) or a long muscular caecum (*multicostata*); internally with longitudinal

pilasters; sheath present. Penial retractor muscle inserting on epiphallus at junction with penial sheath. Free oviduct long. Pallial cavity with complete sigmurethrous ureter. Kidney with large pericardial lobe and rectal lobe reduced to a vestige.

Radula (Fig. 8a-f) with long mesocone on tricuspid central and lateral teeth; marginal teeth almost bicuspid with endocone lengthened and minor ectoconal splitting.

COMPARISONS

Danielleilona has a number of features which clearly separate it from other genera of Charopidae occurring in the Wet Tropics. These include the large, almost discoidal, flammulated shell, the channelled sutures and apertural sinus together with penial diverticulum and sheath. *Oreokera* Stanislje, 1987, has a trochoid shell; *Biomphalopa* Stanislje, 1990, has a biconcave shell; *Setonedea* Hedley, 1924, has a depressed helicoid shell with periostracal hairs; *Hedleyoconcha* Pilsbry, 1893, has a whitish, trochoid shell; and '*Roblinella*' *intermedia* Odhner, 1917 is very small, with a monochrome brown shell. All lack channelled sutures and an apertural sinus. *Danielleilona* and *Oreokera* both have spirally sculptured protoconchs but this superficial similarity is not reflected in anatomy, in particular the difference in pallial structures. Unlike *Danielleilona*, *Oreokera* has an incomplete secondary ureter. *Oreokera* also shows a right angle orientation of the ovotestis, a feature common to few east coast charopids (Stanislje, 1990) and in contrast to the widespread, parallel condition also seen in *Danielleilona*. In addition, the optically observed similarity in apical spiral cords is shown to have structural inconsistency when viewed with the SEM. In *Oreokera* the spirals are much higher than wide and appear as periostracal additions to the protoconch whereas in *Danielleilona* they are low, wider than high, elevations of the protoconch surface.

Conchologically *Danielleilona* bears a striking resemblance to *Roblinella mathinnae* (Petterd, 1879) and to a lesser extent *Roblinella curacaoe* (Brazier, 1871) from Tasmania (Fig. 9a-f). Features which these species have in common with *Danielleilona* include coiling pattern, very strongly protractively sinuated radial ribs, channelled sutures, apertural sinus and spiral protoconch. No soft parts are available in collections to allow rigorous assessment of kinship.

Danielleilona marycolliverae sp.nov. (Figs. 1-4)

ETYMOLOGY

Named for Mary Colliver in recognition of her voluntary contribution to the Queensland Museum Malacology Section.

COMPARISONS

D. marycolliverae differs from *D. multicostata* in having a shell with more widely spaced radials and larger umbilicus. Anatomically the short penial outpocket of *D. marycolliverae* contrasts with the long, muscular penial caecum of *D. multicostata*.

TYPE MATERIAL

HOLOTYPE: QMMO15803, Mt Bellenden Ker, NEQ. Summit TV Stn, 1560m, rainforest (17°16'S, 145°51'E), 29 Apr 1983, G.B. Monteith, D. Yeates. Height of shell 3.83mm, diameter 6.38mm, D/U ratio 4.69, H/D ratio 0.60, whorls 4½.

PARATYPES: NORTHEASTERN QUEENSLAND: Mt Bartle Frere, summit centre pk, ca 1540m, SMVFT (17°23'S, 145°48'E) (1 dead adult, QMMO16473, 7-8 Nov 1981); Mt Bartle Frere, summit north-west pk, 1440m (1 dead adult, AMC150086, 7 Oct 1980, G.B. & S.R. Monteith); Mt Bellenden Ker, summit, 1560m, SMVFT (1 live adult, QMMO11263, 25-31 Oct 1981, Earthwatch/QM); Mt Bartle Frere, summit north-west peak, 1440m, SMVFT (17°23'S, 145°48'E) (1 live adult, QMMO11419, 8 Nov 1981, Earthwatch/QM); Mt Bellenden Ker, summit, 1560m, SMVFT (4 live adults, QMMO16474, AMC150087, 17-24 Oct 1981, Earthwatch/QM); Mt Bellenden Ker, just below summit, approx. 1500m, under bark of rotting logs (6 live adults, QMMO14877, 4 Jul 1983, J. Stanislje, D. Potter).

OTHER MATERIAL: Mt Bellenden Ker, summit, 1560m, SMVFT (2 dead sub adults, QMMO11251, 17-24 Oct 1981, Earthwatch/QM); Mt Bartle Frere, summit centre peak, c.1540m, SMVFT (17°23'S, 145°48'E) (1 broken dead adult, QMMO11398, 7-8 Nov 1981, Earthwatch/QM); Mt Bellenden Ker, summit TV Stn, 1560m, SMVFT (17°16'S, 145°51'E) (1 dead adult, QMMO11893, 17-24 Oct 1981, Earthwatch/QM); Mt Bellenden Ker, summit centre peak, litter, (1 dead juvenile, QMMO16475, 9 Jun 1980, G.B. Monteith); Mt Bellenden Ker, summit TV Stn, 1560m, rainforest (17°16'S, 145°51'E) (1 broken dead sub adult, QMMO15806, 1-7 Nov 1981, Earthwatch/QM); Mt Bellenden Ker, summit TV Stn, 1560m, rainforest (1 specimen, QMMO16476, 29 Apr 1983, G.B. Monteith, D. Yeates).

DIAGNOSIS

Shell large (for family), 6.38-7.23mm (mean 6.64mm) in diameter, with 4½ tightly coiled whorls; body whorl expanding more rapidly.

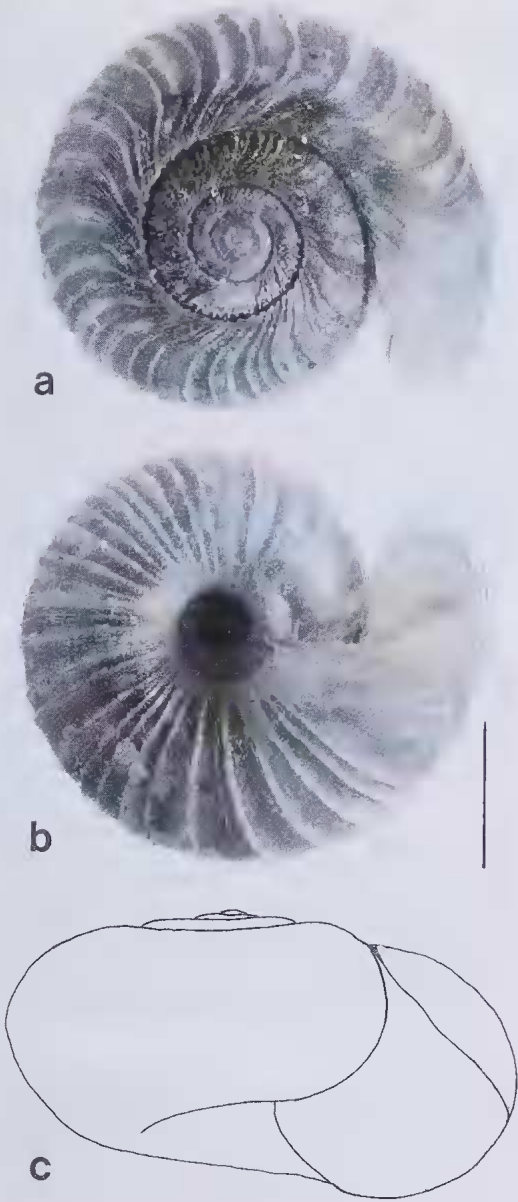


FIG. 1. Shell of *Danielleilona marycolliverae* sp. nov. Mt Bellenden Ker, NEQ, QMMO15803, holotype. Scale line = 2mm.

Apex and spire flat, last whorl descending more rapidly. Height of shell 3.49–3.86mm (mean 3.71mm); H/D ratio 0.53–0.60 (mean 0.56). Protoconch (Fig. 1a) of $1\frac{3}{4}$ whorls, 850 μ m in diameter at $1\frac{1}{2}$ whorls. Apical sculpture (Fig. 2a–c) of 20–25 regularly spaced, rugosely sculptured, low, broad, spiral cords. Postnuclear sculpture (Fig. 2d–f) of very prominent, high, broadly rounded, rugosely and radially sculptured,

strongly protractively sinuated radial ribs, 45–68 (mean 57) on the body whorl, without periostracal blades, with intertices 5–10 times their width. Ribs/mm 2.24–3.39 (mean 2.78). Microsculpture (Fig. 2e) of fine radial riblets, 15–30 between each pair of major ribs, crossed by fine, similarly spaced, spiral cords; microsculpture not reduced below the periphery and also continued onto the sides of the major radials. Umbilicus (Fig. 1b) narrow V-shaped, regularly decoiling, D/U ratio 4.30–4.81 (mean 4.62). Sutures channelled (Figs 1a, 2a); whorls rounded above and below the periphery (Fig. 1c). Colour yellowish-light brown with prominent, irregular, darker reddish-brown flammulations. Aperture roundly lunate. Lip simple, retracted at the parieto-palatal margin to form a deep, apertural sinus. Columella weakly reflected; parietal callus weak. Based on 4 measured adults (QMMO15803, QMMO16473, AMC150086, QMMO16474).

Foot and tail broad, bluntly rounded posteriorly. Body colour (in preservative) creamy white with no obvious markings on foot or neck region; irregular black pigmentation on pallial roof and apical whorls of visceral hump. Ommatophores black. Mantle collar well developed, without mantle gland. Pallial region (Fig. 3f) about $\frac{1}{2}$ whorl apically; kidney twice as long as broad, with prominent pericardial lobe and vestigial rectal lobe. Ureter sigmurethrous with complete secondary ureter and widely diverging arms.

Ovotestis (Fig. 3e) two clumps of finger-like lobes embedded in the apical whorls of the digestive gland and oriented parallel to the plane of coiling. Talon (Fig. 3c) with long coiled stalk, embedded in the albumen gland. Prostate-uterus typical. Vas deferens a thin tube entering epiphallus apically. Epiphallus, thick, muscular, reflexed, partially enveloped in penial sheath; with a small diverticulum at flexure; entering penis apically through a simple pore; internally, ascending branch with longitudinal pilasters, descending branch with small pustules. Penis (Fig. 3b,d) large, sub-cylindrical, with a sub-apical out-pocket containing a terminal, pocket-like, fleshy pilaster and central, longitudinal pilaster which continues into the penis proper. Penis interior (Fig. 3b) with main corrugated longitudinal pilaster and many secondary, low, longitudinal thickenings. Frec oviduct longer than vagina. Vagina short, internally with simple longitudinal thickenings. Spermatheca typical. Based on four dissected specimens (QMMO14877, QMMO-11419, QMMO16474).

RANGE AND HABITAT

Known only from the summits of Mt Bellenden Ker and Mt Bartle Frere (Fig. 4) in the Bellenden Ker Ra., in simple microphyll vine-fern thickets and forests. Collected above the

ground under the bark of rotting logs suggesting semi-arborescence.

REMARKS

D. marycolliverae has been collected

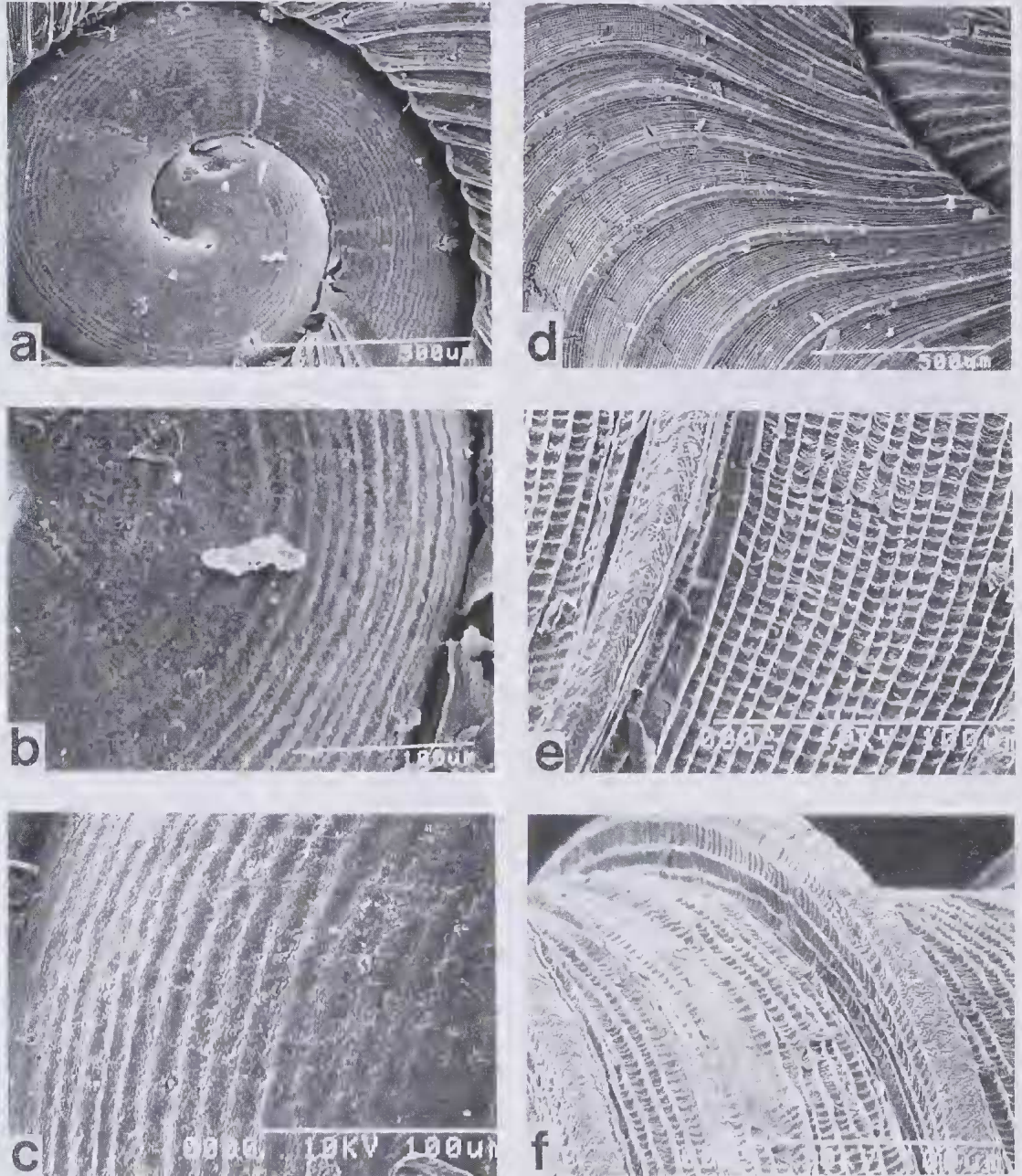


FIG. 2. Shell features of *Danielleilona marycolliverae* sp. nov. Mt Bellenden Ker, NEQ, QMMO16476, paratype. a, protoconch showing channelled suture; b-c, details of protoconch sculpture; d, postnuclear sculpture; e-f, details of postnuclear microsculpture and major rib structure. Scale lines as marked.

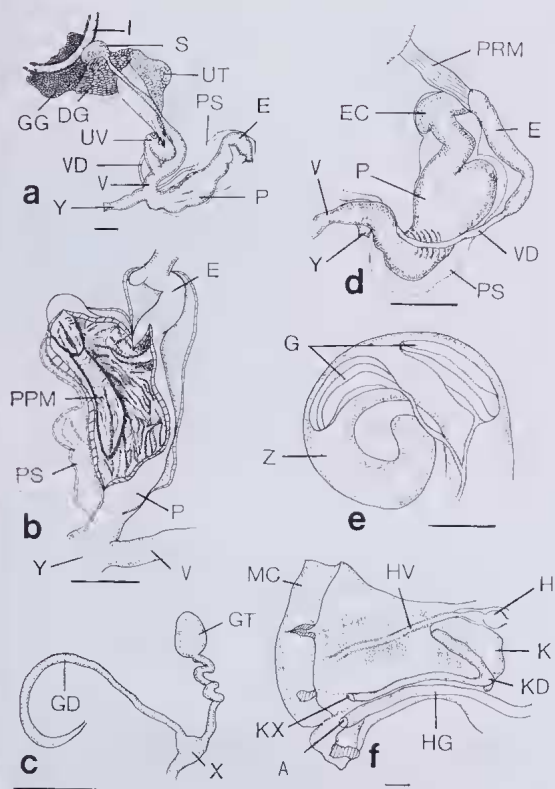


FIG. 3. Anatomy of *Danielleilona marycolliverae* sp. nov. Mt Bellenden Ker, NEQ, QMMO14877, paratype. a, reproductive system; b, penis interior; c, details of talon and carrefour region; d, penis; e, ovotestis; f, pallial cavity. Scale lines = 1mm.

microsympatrically with *Oreokera cumulus* (Odhner, 1917) on Mt Bellenden Ker (QMMO-14877).

***Danielleilona multicostata* sp. nov.**
(Figs. 4-8)

ETYMOLOGY

From the Latin *multi* -, many; *costa* - rib; referring to the adult sculpture of crowded, radial ribs.

COMPARISONS

D. multicostata bears an overall similarity to *D. marycolliverae* but is marginally smaller with narrower umbilicus, and has more crowded ribs on the body whorl (Figs. 1, 5).

TYPE MATERIAL

HOLOTYPE: QMMO33817, North Bell Pk, Malbon Thompson Ra., NEQ, 800-900m (17°05'S, 145°53'E). 19-22 Nov 1990, G.B. Monteith, G. Thompson. Height

of shell 3.78mm, diameter 5.71mm, D/U ratio 6.80, H/D ratio 0.66, whorls 4 $\frac{3}{8}$.

PARATYPES: North Bell Pk, 20km S Cairns, NEQ, 900-1000m (2 dead adults, 1 dead sub-adult, QMMO15490, 15-16 Sept 1981, G.B. Monteith, D. Cook).

DIAGNOSIS

Shell large (for family), 5.71-5.96mm (mean 5.88mm) in diameter with 4 $\frac{1}{4}$ -4 $\frac{5}{8}$ - (mean 4 $\frac{1}{4}$ +) tightly coiled whorls; body whorl expanding more rapidly. Apex and spire flat, last whorl descending rapidly in front. Height of shell 3.49-3.78mm (mean 3.61mm); H/D ratio 0.59-0.66 (mean 0.62). Protoconch (Fig. 6a) of 1 $\frac{3}{4}$ whorls, 850 μ m in diameter at 1 $\frac{1}{2}$ whorls. Apical sculpture of 18-22 regularly spaced, rugose, spiral cords. Postnuclear sculpture of prominent,

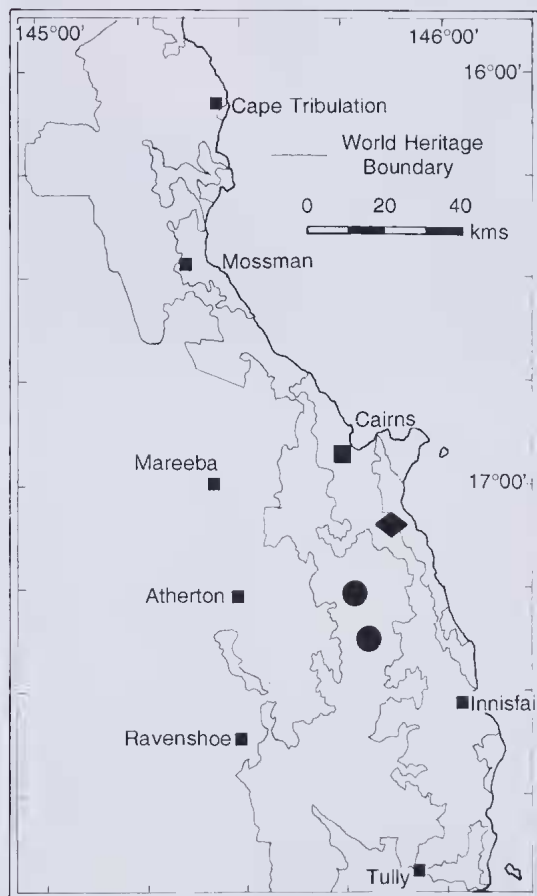


FIG. 4. Distribution of *Danielleilona marycolliverae* sp. nov. (dots) and *D. multicostata* sp. nov. (diamond) in the Wet Tropics region.

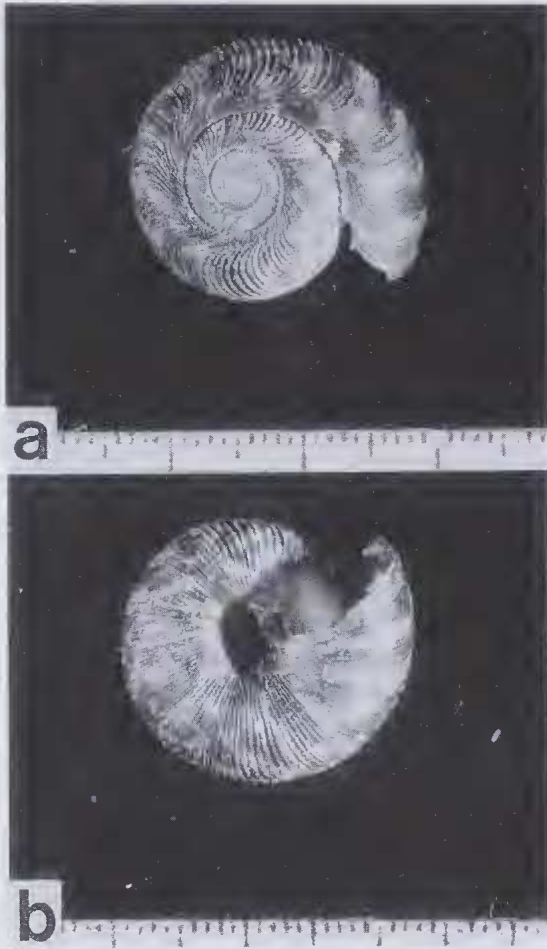


FIG. 5. Shell of *Danielleilona multicostata* sp. nov. North Bell Peak, NEQ, QMMO33817, holotype. Scale in mm.

crowded, strongly protractively sinuated, radial ribs, 93-108 (mean 101) on the body whorl, with interstices 5-7 times their width. Ribs/mm 5.18-5.77 (mean 5.47). Microsculpture of fine radial riblets, 12-20 between each pair of major ribs, crossed by fine spiral cords to form a reticulate pattern; sculpture continuous on base. Microsculpture (Fig. 6b) continuous on sides of major radials. Umbilicus (Fig. 5b) very narrow, U-shaped, barely decoiling. D/U ratio 5.38-6.80 (mean 6.00). Sutures channelled; whorls rounded above and below the periphery. Colour light yellow-brown with irregular, darker, brown suffusions. Aperture roundly lunate. Lip simple, retracted at the parieto-palatal margin to form a conspicuous apertural sinus. Columella slightly reflected over the umbilicus. Parietal callus

present. Based on 3 measured adults (QMMO-33817, QMMO15490).

External animal features similar to *D. marycolliverae*. Pallial cavity with typical kidney and complete sigmurethrous ureter. Apical genitalia not studied. Terminal genitalia (Fig. 7a) similar to that of *D. marycolliverae* except for penis morphology. Penis (Fig. 7b) with long, muscular caecum; internally with simple, low longitudinal pilasters. Penial caecum entering penis subapically about $\frac{1}{3}$ of the way down through a muscularised pore. Penis sheath present.

Radula (Fig. 8a-f) with tricuspid central and lateral teeth; marginals multicuspid with enlarged endocone, ectocone split into minor cusps.

Based on one dissected specimen (QMMO-33817).

RANGE AND HABITAT

Known only from 4 specimens collected from the top of North Bell Pk on the Malbon Thompson Ra., NEQ (Fig. 4), in simple microphyll vine-fern forest. No microhabitat data is available.

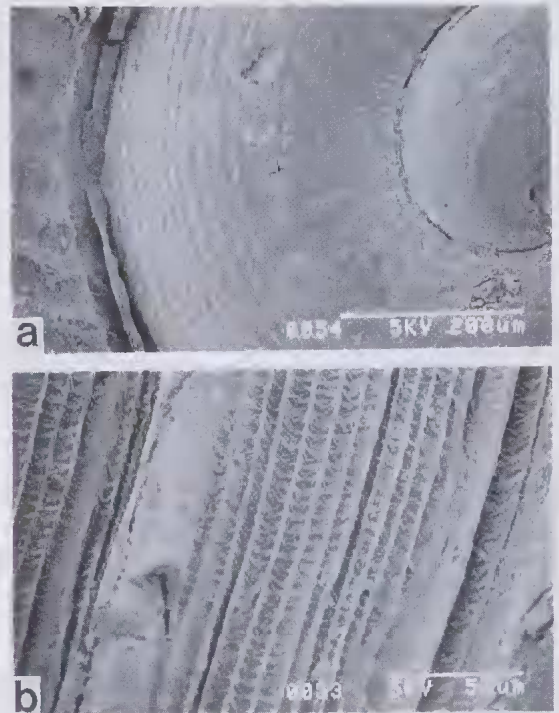


FIG. 6. Shell sculpture of *Danielleilona multicostata* sp. nov. North Bell Peak, NEQ, QMMO15490, paratype. a, apical sculpture; b, postnuclear microsculpture. Scale lines as marked.

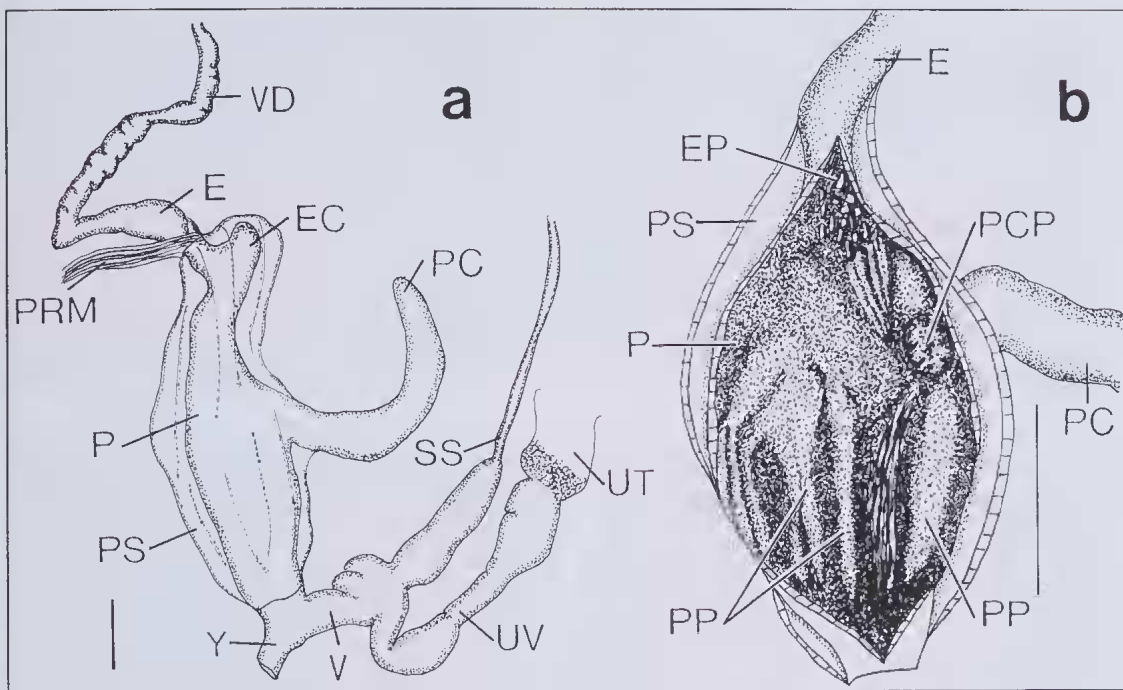


FIG. 7. Anatomy of *Danielleilona multicostata* sp. nov. North Bell Peak, NEQ, QMMO33817, holotype. a, terminal genitalia; b, penis interior. Scale lines = 1mm.

REMARKS

Although this species is known from very limited material, shell and anatomical characters readily separate it from *D. marycolliverae*.

DISCUSSION

The discovery of *Danielleilona* highlights the unusual nature of the mountain top communities in tropical northeastern Queensland. Previously, Stanisc (1987, 1990) provided examples of land snails from these environments which displayed both narrow and widely disjunct generic distributions. This is the first example involving the Bellenden Ker and Malbon Thompson Ranges. Summits of their higher peaks are characterised by the occurrence of simple microphyll vine-fern forest (SMVFF). This grades into thicket (SMVFT) on the higher mountains of the Bellenden Ker Ra. Presumably these cool moist, largely temperate mountain top communities would have had a more widespread distribution involving the lowlands in cooler, wetter times. Climatic change, particularly in the Plio-Pleistocene, had a dramatic impact on 'temperate' communities (Galloway & Kemp, 1981) leading to their present-day restriction in the north. Temperate communities remained only on those peaks with

the high altitudes necessary to preserve them, and extinctions undoubtedly occurred on lower peaks.

A key ingredient in the survival of *Danielleilona* appears to be the presence of SMVFF on the Bellenden Ker and Malbon Thompson Ranges. However the absence of SMVFT from the latter could be the crucial factor in the disparate distribution of *Oreokera* Stanisc, 1987, which is sympatric with *Danielleilona* in the Bellenden Ker Ra., but missing from the Malbon Thompson Ra. The morphological gap between species of *Danielleilona* is greater than that recorded for species of *Oreokera* which may indicate a more stringent environmental and climatic selection regime on North Bell Pk montane communities.

Some species of Charopidae, (e.g. *Setomedea monieithi* Stanisc, 1990), are found in the warm humid mesophyll vine forests of the lowlands and foothills of the Wet Tropics, but most are confined to the uplands and highlands. Those now found in lower areas also would probably have depended on montane refugia for survival in the past, but have been able to disperse rapidly in recent times (Stanisc, 1990). Significantly, *Setomedea* has species in central and southern Queensland, indicating wide environmental

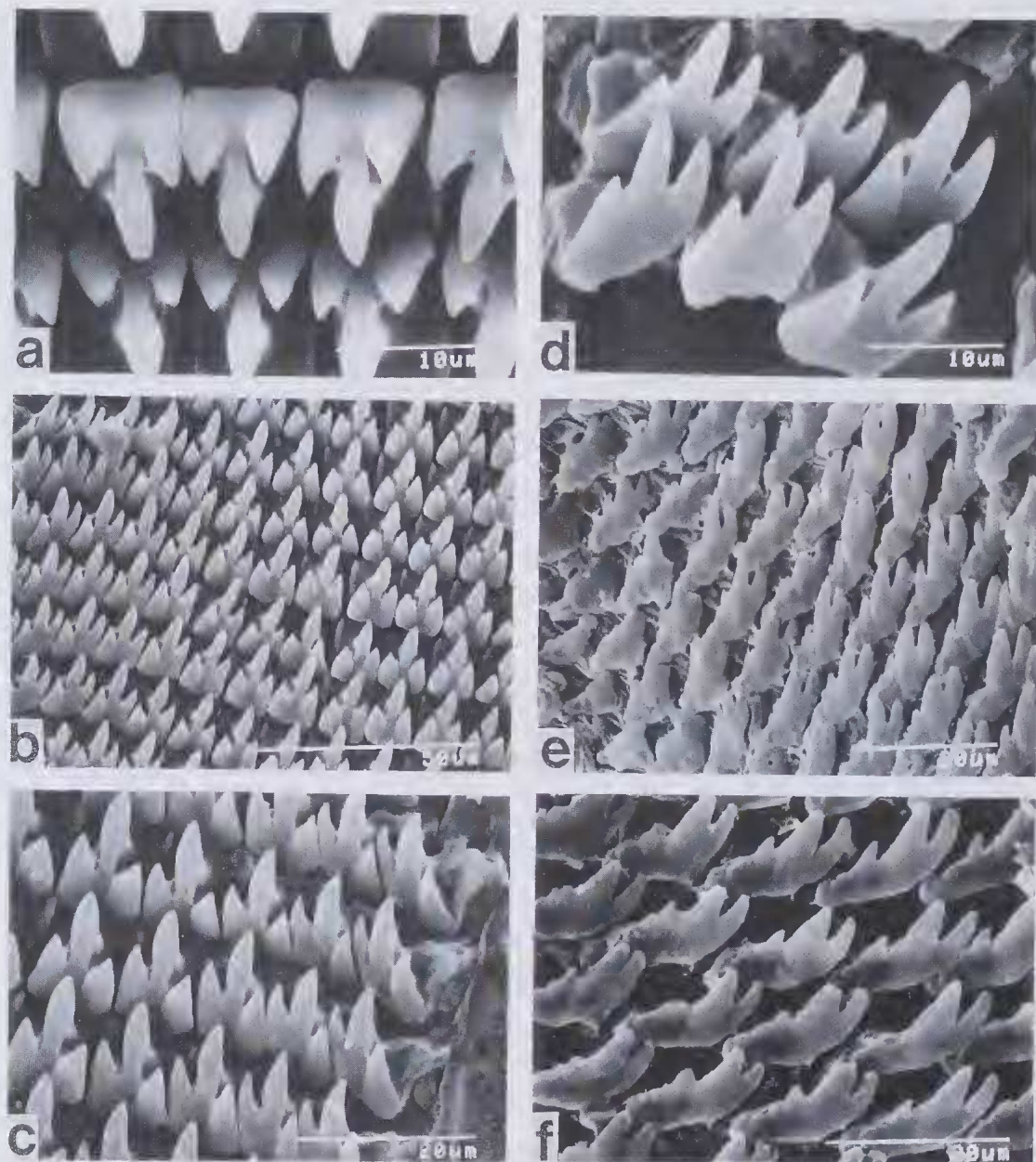


FIG. 8. Radula of *Danielleilona multicostata* sp. nov. North Bell Peak, NEQ, QMMO33817, holotype. a, central and inner lateral teeth; b, laterals and lateromarginals; c, lateromarginals showing squarish basal plate; d, laterals and first lateromarginal showing ectoconal reduction; e-f, lateromarginals and marginals showing ectoconal reduction and ectoconal splitting. Scale lines as marked.

tolerance. The specialised microhabitat of *Danielleilona* (semi-arboreal) probably reflects a higher degree of environmental sensitivity than for generalist 'under-the-log'-dwelling species such as *Setomedea*.

Danielleilona displays a suite of conchological

and anatomical characters which place it outside the mainstream of charopid evolution in tropical and subtropical eastern Queensland. The large shell with channelled sutures, apertural sinus and very strongly, protractively sinuated radial ribs,

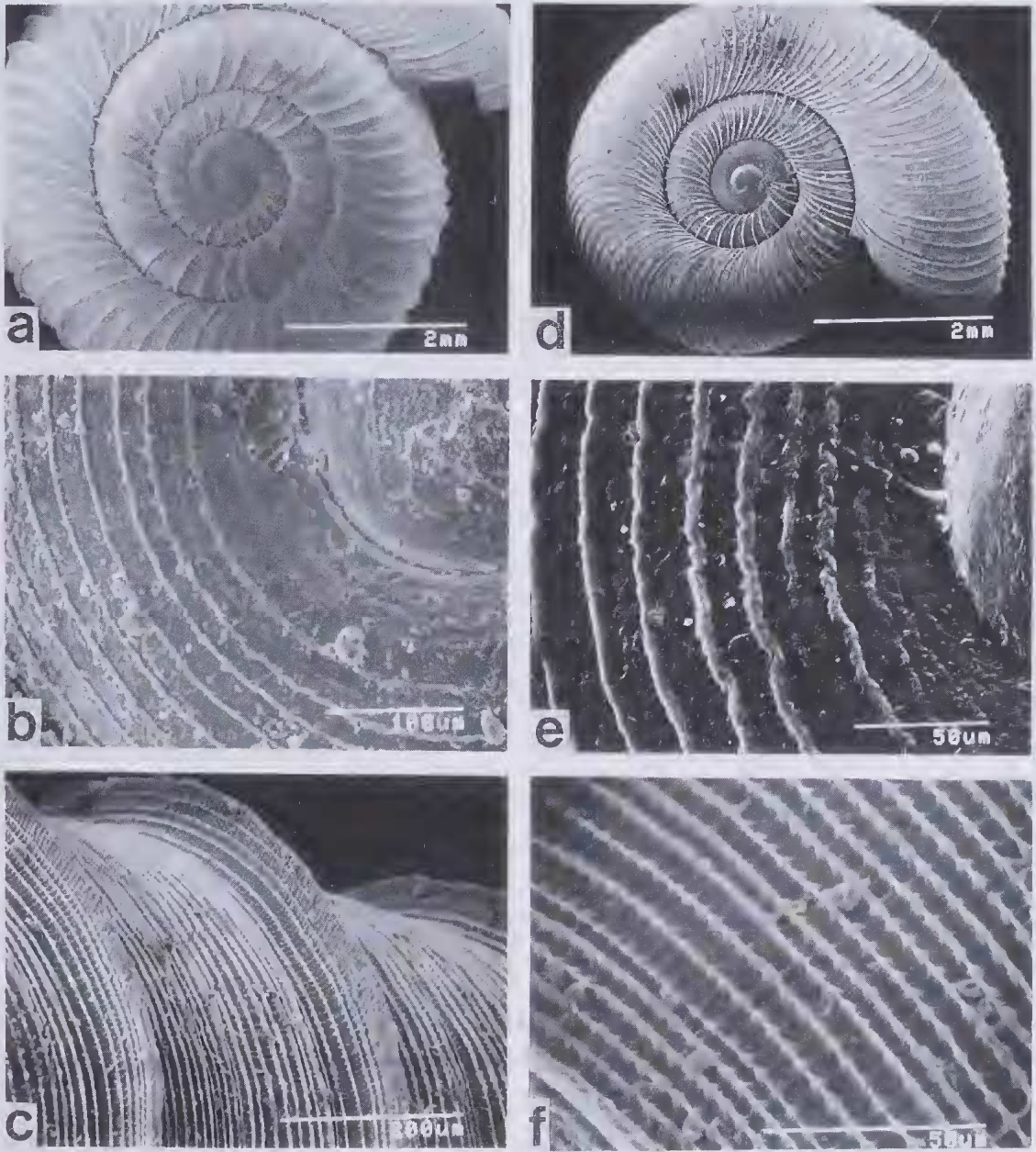


FIG. 9. a-c, *Roblinella mathinnae* (Petterd, 1879). Tasmania, AMC103794. a, shell; b, protoconch sculpture; c, postnuclear sculpture. d-f, *Roblinella curacaoe* (Brazier, 1871). Tasmania, AMC103518. d, shell; e, protoconch sculpture; f, postnuclear microsculpture. Scale lines as marked.

together with the penial sheath and penial diverticulum are major differentiating features.

The occurrence of a number of very similar shell features in Tasmanian taxa (Fig. 9a-f) may have important biogeographic implications. Southern relationships have been demonstrated in a number of Wet Tropics charopid genera by

Stanisic (1990), but a Tasmanian connection would span a geographic gap shared by plants (*Orites*), the Pcloridiidae (moss bugs) and the stag-beetle genus *Lissapterus*. These are all 'antarctic' relicts (Monteith, 1980) occurring in montane refugia in subtropical and tropical areas.

Stanisic (1990) showed that protoconch sculp-

ture and adult microsculpture were useful shell characters for indicating relationships among the Charopidae. A spirally lirated protoconch is rare in tropical and subtropical Australian species. Most have radially ribbed or reticulate protoconchs. The presence of spirally lirated protoconchs (Fig. 9b,c) and similar shell microsculpture (Fig. 9c,f) in *R. mathinnae* and *R. curacoae* may not be sufficient to indicate possible relationships. However, combined with the co-occurrence of an apertural sinus, strongly protractively sinuated radial ribs and channelled sutures (Fig. 9a,d) there is a tantalising prospect that these taxa are more closely related than they are to others in the family.

ACKNOWLEDGEMENTS

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